Europe | Middle East | India | Africa
Airex AG
5643 Sins, Switzerland
T +41 41 789 66 00
corematerials@3AComposites.com

North America | South America
Baltek Inc.
High Point, NC 27261, USA
T +1 336 398 1900
corematerials.americas@3AComposites.com

Asia | Australia | New Zealand
3A Composites (China) Ltd.
201201 Shanghai, China
T +86 21 585 86 006
corematerials.asia@3AComposites.com

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Welcome to BALTEK®

It is not only the most premium balsa wood core material.
It is a full bundle of solutions for sandwich composite structures with the lowest CO_2 footprint on the market.

CORE MATERIALS

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CORE MATERIALS

Introduction, Storage, Handling, Use & Processing Guidelines

BALTEK® SBC, VBC, IG, IGp, Structural Balsa Cores

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The contents in this document are to be considered the terms of use for the product unless otherwise agreed to with **3A Composites Core Materials**.

The document references finishing options and configurations available in the BALTEK® product portfolio. Please refer to the technical data sheets and other available information in the website for obtaining details about the current options.

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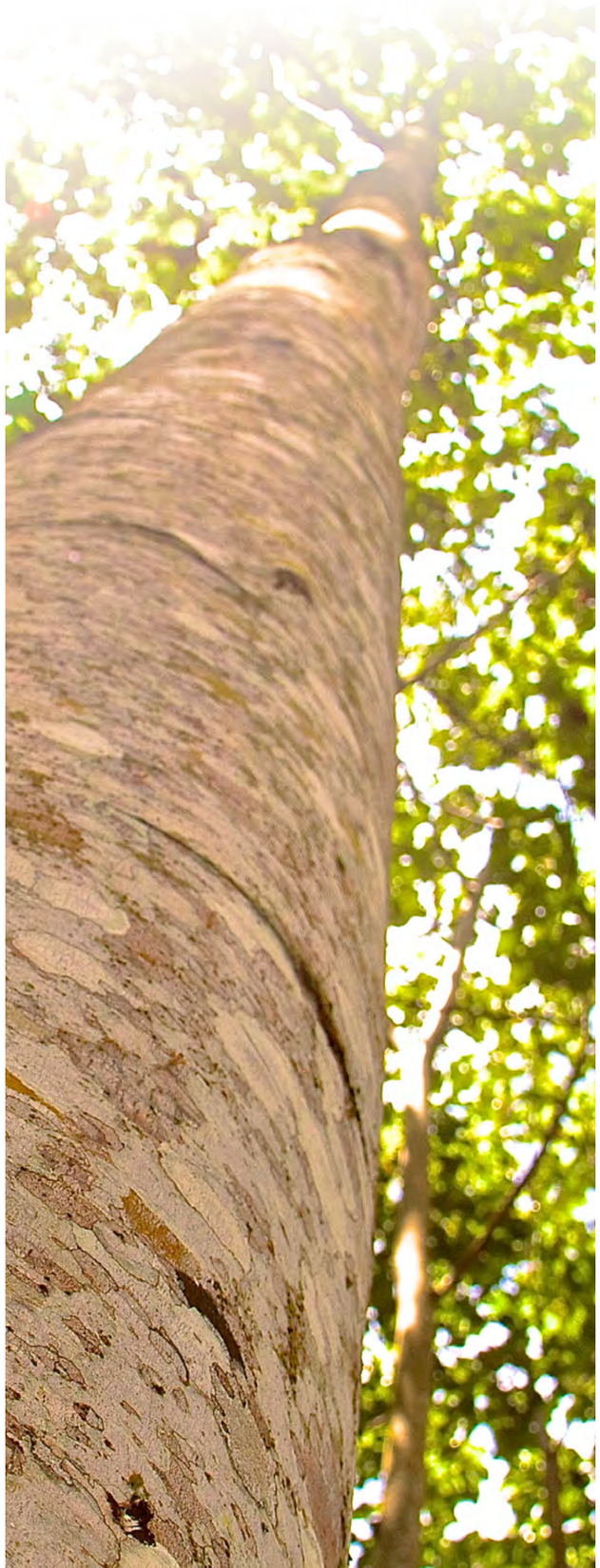
3A Composites Core Materials has a dedicated Technical Services department in each region served. In case support, guidance or consultancy is required about the application, use, processing or choice of our core materials please reach out to our support team.



1 Balsa wood characteristics

1.1 Wood imperfections and defects

Balsa wood is a natural product. While in many applications wood is appreciated for its features that make it unique, the application as a core material requires that some of these features are discarded to avoid issues in the processing and the ability to withstand static or dynamic loads.

Wood features in the context of **BALTEK®** balsa cores may be divided into two categories:

Imperfections and defects. But what is the difference between the two?

An imperfection is a wood feature that poses no risk to the performance of a structural core material and may be present either unlimitedly or within certain limits, depending on the product type.

A defect is a wood trait that does create impact in the performance or incompatibility with processing and therefore is forbidden or heavily restricted.

To draw this line, **3A Composites Core Materials** has decades of experience testing its materials to determine which features deviate from the usual scatter of mechanical properties and those that are within.

Table of Wood Imperfections and Defects

Item	Definition	Picture	Imperfection or Defect
Mineral stains	Inclusion of minerals from soil in cells walls. Color: Yellowish, darker green to brown. Usually appears in radial patterns.		Imperfection (limited in size and number for certain product)
Blue stains	Bluish or greyish discoloration of sapwood.		Imperfection (depending on type of product it may be restricted)
Mold	Dark colored fungi occurring typically in moist warm conditions. It occurs for very wet balsa (MC >>25%), mainly because of transportation issues.		Defect
Decay stains	A thin black line with mostly closed shape, caused by fungi that eats up the wood fibers.		Defect
Piths	Soft zone within the center of the tree with essential and specific physiological functions.		Imperfection (limitation based on size for certain product)

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Item	Definition	Picture	Imperfection or Defect
Shecks	Circular separation in radial direction. Mostly darker than the surrounding wood.		Imperfection (limited in size and number for certain product)
Small knots	A knot is the beginning of a branch embedded within the trunk.		Imperfection (limited in size and number for certain product)
Tight knots	A knot is the beginning of a branch embedded within the trunk.		Imperfection (limited in size and number for certain product)
Hollow knots	A knot is the beginning of a branch embedded within the trunk.		Imperfection (limited in size and number for certain product)

2 Storage Considerations of **BALTEK®** end-grain balsa products

2.1 Storage

All **BALTEK®** products should be stored in the original (undamaged) packaging, indoors at temperatures above freezing and less than 140 degrees F (60 °C) and 80% relative humidity. It should be kept dry at all times. The polyethylene bag should not be removed until just prior to use.

BALTEK® core should not be stored with solvents as the volatiles can be absorbed by the material.
While this does not affect the product, it can have adverse effects on laminate cure and properties.

2.2 Shelf life

BALTEK® products do not have a defined shelf life based on technical considerations.

It's important to note that even though the product has no defined shelf life, it should be stored properly to maintain its quality and effectiveness. If the product is stored outside of the recommended conditions, its performance may be impacted, and it may not be eligible for a claim.

If the product remains in its original, unopened, and undamaged packaging, any issues related to the product's condition that are not caused by improper storage shall be claimed to the selling entity.

However, for claim purposes, a 12-month shelf life is specified on the product labels from the packaging date. Even though balsa wood, does not have an expiration date or defined shelf life that precents the product from being, a 12-month period is specified in the label. A claim can be processed according to the aforementioned conditions only within this timeframe.

2.3 Handling and Manipulations

It is recommended to bring the material in the shop and unwrap from polyethylene bag a minimum of 24 hours before use to allow Balsa to reach the equilibrium moisture content.

If the shop is in a non-controlled environment, the Balsa product may need previous conditioning depending on the type of processing

If removed from its packaging, it is recommended that the material be kept off the floor (on bottom-protected dollies or pallets) to prevent dirt and moisture pickup. A piece of cardboard should also be kept on top of the material to cover against moisture and dust contamination.

Packages of the contourable (CK) material should be opened with the scrim side down, so blocks are not pulled off when one sheet is lifted off the stack. CK material should be handled with care.

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3 Incoming inspection Criteria

All **BALTEK®** products are manufactured using world class manufacturing and the most strict quality checks and criteria. Nonetheless, incoming inspection is encouraged to verify the product meets the criteria in the latest standing Technical Data Sheet (TDS). Any defect after processing of the product is no longer acceptable within the standard terms.

3.1 Visual inspection

All **BALTEK®** products are prime grade balsa wood. As wood is a natural product, it may show imperfections that only appear as cosmetic details with no impact to performance. On the other hand, certain wood defects (much larger features) may have an impact in processing, therefore are excluded from the product. Material should be visually inspected for any major visible defects, such as cracks, splits, knots, voids, or delamination. Any defect that affects the structural integrity of the material should be rejected.

3.2 Density

BALTEK® products are chosen due to their unrivaled weight-to-mechanical properties ratio. These properties have a correlation with density which is directly proportional.

BALTEK® density is assured according to the latest standing Technical Data Sheet (TDS) where the functional unit is a sheet. Any unit smaller than a sheet may show variation from the values in the TDS, as a sheet is the result of the combination of multiple balsa lumbers.

In order to assess density, it is suggested to have the appropriate gauges to ensure accuracy in the measurements:

- For thickness measurement, it is recommended to use a Caliper (for thickness up to 150 mm with a precision of ± 0.05 mm according DIN EN 324).
- For width and length, a Measuring tape for width and length and thickness (> 150 mm) with an 1 mm scale interval according DIN EN 324 is recommended.
- Analytical Scale to determine the mass of a sheet with an error limit of 0,5% according ASTM C271.

The volume is calculated after measurement of length, width and thickness. The density of the sheet is calculated as the ratio of the sheet weight and the corresponding sheet volume.

It's important to note that the above procedure provides the density of the balsa wood sheet at the specific moisture content and temperature at which the measurements were taken. If the moisture content or temperature of the balsa wood sheet is significantly different, the density may also differ. Therefore, it's recommended to perform this procedure under controlled environmental conditions, and to specify the testing conditions when reporting the density values.

3.3 Moisture Content

Moisture absorption is a physical property of balsa wood that describes its ability to absorb and retain moisture from the surrounding environment. Balsa wood is a porous material that contains cells and its cell walls that can fill with water molecules when exposed to a humid environment or contact with water.

The moisture absorption of balsa wood is affected by several factors such as the initial moisture content of the wood, the temperature and humidity of the surrounding environment, the surface area and exposure time, and the porosity and density of the wood. The equilibrium moisture content of wood can be seen in the graph below (shown as contours) as a function of temperature and relative humidity.

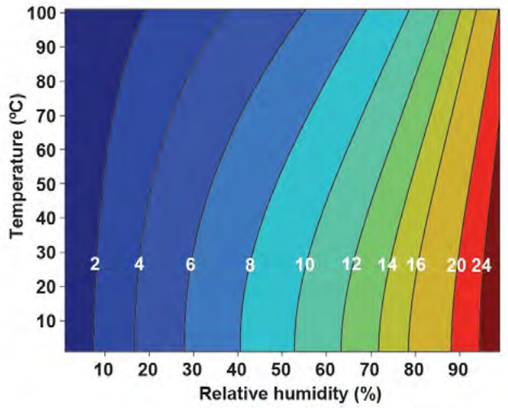


Figure 4.1. from Wood Handbook: Wood as an Engineering Material (United States Department of Agriculture Forest Service, Forest Products Laboratory, 2021)

BALTEK® products undergo kiln-drying processes that are specifically designed for balsa wood to ensure a high-quality and consistent product. The moisture content of the products is guaranteed to be under 12% EXW (ExWorks is a trade term indicating that the seller has fulfilled their obligations when the goods are available for pickup at their premises), and a Certificate of Analysis (CoA) for each batch may be available upon request.

AL coating, available as a surface treatment option may help to reduce moisture absorption rate. It is advised in harsh weather conditions.

It's important to note that moisture content is a dynamic parameter that can change during transport and storage. Therefore, the actual moisture content of the **BALTEK®** products upon arrival at the customer may be different than the guaranteed value. Factors such as temperature, humidity, and exposure time during transport and storage can affect the moisture content of the products.

It's recommended to store **BALTEK®** products in a controlled environment with stable temperature and humidity conditions to minimize any potential changes in moisture content. If the moisture content of the products is critical to the customer's application, it's recommended to measure the moisture content upon arrival and adjust any processing parameters accordingly.

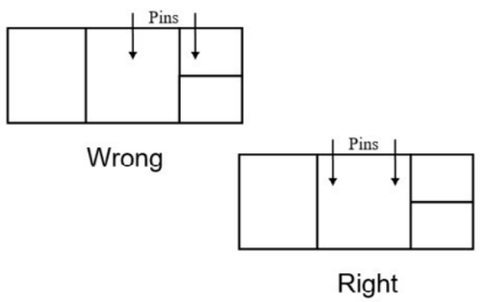
3.3.1. Checking moisture content (MC%)

It is highly recommended to use a pin-type moisture meter in order to check MC of all **BALTEK®** products.

The Delmhorst J-2000 series or equivalent are the gauges proven and approved by **3A Composites Core Materials** for this inspection.

It Is important to note the following when performing a moisture content validation:

- Make sure the device is properly calibrated using the calibration check button
- Make sure to use the correct setting of reference temperature and wood species. While there is no designated setting for balsa wood, it is recommended to use “Douglas Fir”. **Having a wrong setting can dramatically alter the result of the reading.**
- Always insert pins on the end grain surface, not in the sides of a **BALTEK®** sheet.
- Never insert pins across glue lines or CK modules. Please refer to the graphic below



The MC of a sheet is given as the average of minimum 5 measurements. We recommend to make these not too close to each other. It is encouraged to measure at the edges (4) and at the center for a more accurate assessment of the material.

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3.4 Verification of sheet dimensional properties

3.4.1 Thickness

Core material thickness is a crucial property that directly impacts the performance of the final product. To ensure consistent thickness, all **BALTEK®** products are manufactured with tight tolerance and surface uniformity, adhering to the latest technical data sheet (TDS) for standard or precision (PRE) thickness tolerances.

When measuring the thickness of **BALTEK®** balsa wood sheets, it is important to consider the following:

- Select an appropriate gauge for measuring the thickness, such as a calibrated caliper with a resolution of hundreds of a centimeter or thousands of an inch.
- Measure the thickness at the glue lines to avoid creating an indentation in the balsa wood sheet, which may result in an underestimation of the thickness value.
- Avoid applying too much pressure while measuring to prevent any tool indentations on the core material.
- Take measurements (eight points are strongly advised) along the sheet to ensure consistency and accuracy.
- An individual measurement outside of the specified tolerance implies material shall be rejected

By following these guidelines, the thickness of **BALTEK®** balsa wood sheets can be measured accurately and consistently ensuring optimal performance in the final product.

3.4.2 Length, Width and Squareness

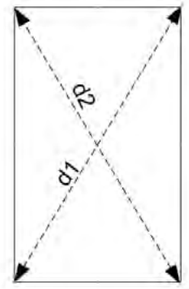
BALTEK® balsa wood core sheets are manufactured with strict tolerances for length, width and squareness.

It is recommended to use a tape measure and / or steel ruler as the adequate tools for evaluation of these dimensional properties.

As general guideline it is strongly encouraged:

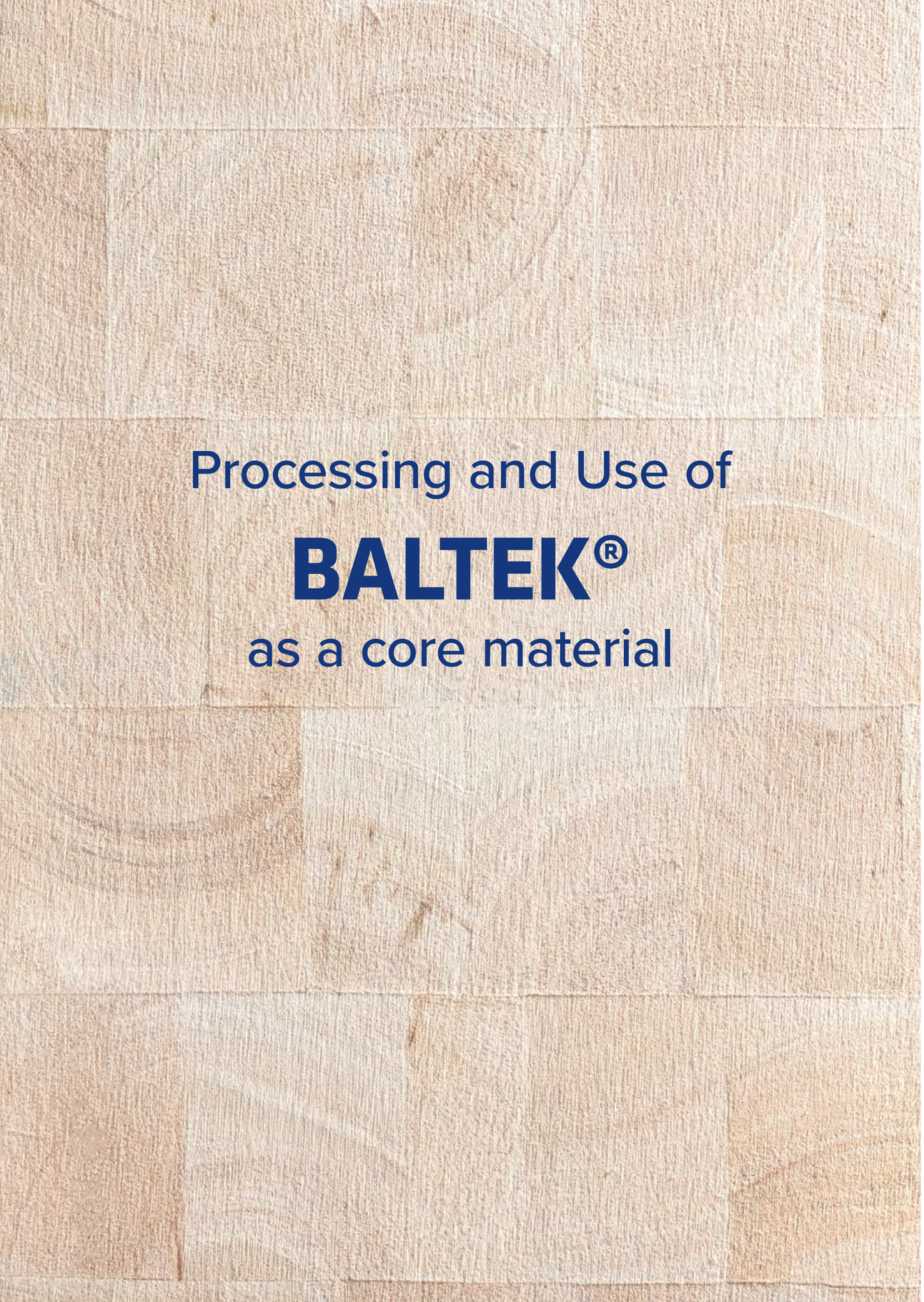
- Ensure the tool has clearly marked markings (preferably both in metric and imperial units) and its measurement accuracy is up to standard.
- Ensure the sheet is placed on a flat and level surface, free from any obstructions or debris.
- Make sure the panel is adequately supported to prevent any sagging or bending during measurement

With respect to squareness, it is recommended to evaluate this with the method of difference between diagonals. Measure the lengths of both diagonals by extending the tape measure or ruler from corner to corner and compare the diagonal measurements to check for any deviations beyond specified tolerances.



Moisture Content (referenced in section 2.3) fluctuations during transport and storage may influence dimensional changes in length, width and squareness.

These changes are largely reversible. To restore the sheet to its original condition (EXW), allow the material to acdimate in a dry and cool environment for a minimum of 24 hours and reassess.



4 Mechanical conversion processing

BALTEK® Balsa wood panels are easily processed using standard woodworking equipment and tools. However, it's crucial to apply the same considerations as you would with other woods to ensure a pristine finish, prevent overheating, and avoid other unsatisfactory outcomes.

Important Note:
While these general guidelines are based on experience, it's important to recognize that each machining scenario may present unique challenges. As such, trials are recommended to validate machining results and fine-tune the process parameters according to your specific circumstances.

Milling:
Milling balsa wood is a versatile operation that can be accomplished using both standalone milling machines and CNC routers. Ensure your milling tools are sharp and in good condition. Experiment with feeds and speeds, adjusting them according to the intricacy of your project. Pay attention to the angles of your milling tool, as this can affect the surface finish. When securing balsa wood to the table, use appropriate fixtures or methods (e.g. vacuum) to prevent movement and vibrations as these can affect the end result of the process. Adequate dust clearance is vital to maintain a clean workspace and prevent buildup on the material.

Regular parameter ranges:
- RPM: 10000-20000
- Feed rate: 1-7 m/min.

Additional considerations should be taken into account depending on thickness and density to be machined. Other factors such as finish patterns come into play, and trials in this operation as in others, are recommended in order to determine if more than one pass or different machining parameters need to be added.

Routing:
Routing balsa wood, whether on a standalone router or a CNC router, requires precision and attention to detail. Use sharp router bits to achieve clean cuts. Adjust feeds and speeds based on the design and nesting of parts. Pay close attention to the angle of the router bit for optimal results. Secure the material firmly to the table to prevent movement during the routing process. Vibrations can affect the quality of the cut, so take measures to minimize them. Appropriate dust collection will remove the hazard of any material build up on the tool.

Regular parameter ranges:
- RPM: 10000-20000
- Feed rate: 3-12 m/min.

Facing:
Facing balsa wood involves different options and configurations, for all of them, keep the cutting tools sharp for a smooth finish. Experiment with feeds and speeds to find the right balance for your specific project. Normally, due to the nature of the material, slower feeds are recommended to avoid fibers getting excessively teared. Secure the balsa wood to the table with appropriate fixtures to prevent any movement during the facing process. Monitor angles to achieve the desired surface quality. Implement an efficient dust clearance system to maintain a clean working environment.

Regular parameter ranges:
- RPM: 8000-15000
- Feed rate: 1-8 m/min.

Saw Cutting:
Saw cutting balsa wood can be accomplished using various woodworking saws, whether on standalone machines or CNC setups. Ensure saw blades are sharp for clean cuts. Certain saw blades are manufactured to reduce vibrations of the blade body while cutting, these are recommended to ensure uniformity on the panels

faces being cut. Secure the balsa wood to the table with proper fixtures to prevent movement during cutting. Monitor angles and blade positioning for precision. When performing chamfering, if the chamfer is to cover the full thickness of the panel, it is recommended to leave a small thickness straight at the edge to avoid leaving the area prone to breakage.

Regular parameter ranges:

- RPM: 3000-6000
- Feed rate: 1-5 m/min.

These are general guidelines, and it's crucial to conduct trials and adjustments based on your specific equipment, tooling, and balsa wood characteristics.

5 Sandwich Panel Fabrication **BALTEK®** End Grain Balsa Core Material

5.1 Wet Lay Up FRP Face Skins

Flat panels are best made in a press or with vacuum bag compaction.

The recommended core configuration for vacuum bag compaction is **BALTEK®** AL600/10 perforated.

The recommended core configuration for use in a Platen Press is **BALTEK®** AL600/10 rigid (perforations are not required for a platen press).

The recommended core configuration for use with Contact Moulding (without press or vacuum bag compaction) is **BALTEK®** contourable (CK). A double roller fabric resin impregnation machine can be useful for large panel or large volume wet lay up production.

BALTEK® LamPrep should have the down side pre-wet with standard catalyzed resin immediately before application into the Chopped Strand Mat (CSM). **BALTEK®** AL600/10 coated balsa does not require pre-wetting when being bedded into CSM. Prewetting is recommended for all contourable forms of **BALTEK®** cores to ensure proper filling of the kerfs.

If Polyester or Vinylester resins are used, a layer of 0.75 oz to 1.5o z CSM is recommended next to the core to improve laminate peel strength. The mat can be part of a knitted fabric such as an 18 oz 0/90 with a 3/4 oz mat backing. Epoxy resin systems typically do not require this layer of CSM for adhesion purposes. Removable peel ply used on each face could well reduce subsequent surface preparation.

5.2 Contact Molding

Lay up the first skin using normal laminating techniques. Position the sheets of core and use metal compaction rollers with moderate pressure to bed each sheet evenly into the laminate surface. It is important that no voids remain between the laminate and the core. Apply the second skin using normal laminating techniques.

5.3 Vacuum Bagging

Use a smooth flat nonporous surface prepared with a release agent. Allow an extra 6 -12 inches around the perimeter of the panel blank for vacuum bag attachment. Lay up the first skin using normal laminating techniques. Position the sheets of **BALTEK®** core without gaps. Apply the second skin.

Normal vacuum bag techniques apply, and they could include a layer of perforated release film, a layer of breather/bleeder cloth and then vacuum bag. If possible, evacuate the vacuum bag from the edge of the panel. If the panel is large, use multiple vacuum hose connections or a perimeter manifold. First pull 10 - 15 inches of mercury (0.5 - 0.65 bar vacuum) for initial compaction then reduce the vacuum to 5 inches of mercury (more than 0.8 bar vacuum), to avoid excess resin bleed, until cured.

5.4 Vacuum Infusion (VARTM)

Vacuum infusion (aka resin infusion) is a closed mold process where the 2nd or B-side mold is a flexible or semi-flexible membrane, typically a vacuum bag. The benefits of this specific process are low capital costs, unlimited part size, as well as molding parts with negative draft. All the air in the part is evacuated, with vacuum levels greater than 0.8 bar. It is important to use materials & equipment appropriate for infusion especially the correct vacuum pump. The tooling (mold) for any part to be infused must be vacuum tight and designed with the infusion process in mind; flanges should be wider than for open molding.

The vacuum infusion process automatically meets 2 of the 4 principles of proper core installation; proper bed layer and fill all kerfs. This ensures a high quality laminate without voids and prevents water intrusion. The other tenets, fillet the edges and segregate the core can be designed into the part very easily, often more easily than open molding.

Infusion creates the opportunity for more efficient, lighter and less expensive laminates. Fabric properties are all higher than open molding and a high quality, void-free laminate permits the use of lower factors of safety in part design.

Vacuum infusion follows a specific equation which defines how far or how fast the resin will flow through the part. Darcy's Law, named for Henry Darcy, which defines how a fluid flows through a porous medium.

Darcy's Law $$q = -\frac{k}{\mu}\Delta P$$

Where:
P= pressure
μ = Fluid viscosity
q = Flow rate
k = Porosity/permeability

In VIP the pressure comes from the atmosphere pushing down on the liquid surface of the resin supply. The laminate defines the permeability and the resin is the fluid. Full vacuum (the maximum obtainable) should always be used with infusion.

Because the pressure differential is always slightly less than 1atm, there is a maximum distance the resin can flow for any given resin viscosity, laminate stack & temperature. Since resin is dependent on temperature, it is important to produce parts within the range recommended by the supplier.

There are generally two aspects to consider with resin flow, across the laminate and through the thickness.

Fabric & resin:
It is strongly recommended to use only resins specifically formulated for vacuum infusion. Resins for open molding are made to not flow since they are often applied to vertical surfaces. It is also important to understand that all of the resin in the part will cure at the same time with infusion. The viscosity profile and cure kinetics must consider the VIP process. With sandwich laminates some of the resin is curing under the core which acts as in insulator.

There are fabrics designed to assist resin flow in the infusion process. It is best to consult your local distributor and/or fabric supplier for training on selecting fabrics for infusion, however it is not required to use fabrics tailored for VIP. Unlike open molding, the limit on fabric weight becomes the ability to handle and install the dry fabric, not wet it out by hand. This creates the opportunity to design far more efficient laminates with fewer layers.

One benefit of VIP is the interlaminar shear strength between plies is far greater than open molding, as is the bond strength between the skin and core. It is not required to use random orientated fiber mat between plies and against the core.

Fabrics will compress under vacuum and certain products will compress more than others. This is important to know when converting laminates from open molding or designing new parts. We can assist with conversion or "infusion" laminate design.

It is recommended to test all materials to determine their porosity or flow rate of the resin, individually as well as together. Particularly for thick or hybrid laminates, if specific products do not flow resin as well as others, there can be a mismatch with certain core finish options or resin flow media. This can potentially lead to porosity or dry spots in a part.

How to distribute resin into the part [pictures/graphics]:

- Surface media: this method uses a material designed to flow resin placed over the surface of the part and removed after cure.
- Interlaminar media / flow friendly fabrics: this method incorporates a material within the laminate stack which provides resin flow. Fabric suppliers offer products designed to flow resin or combined with flow media or continuous filament mat Lantor SORIC® products are often used for this purpose.
- Core channels: this method uses surface grooves machined into the core sheet (one or both surfaces) designed to flow resin.

When incorporating a core material with the first two (surface/interlaminar) methods, we recommend using **BALTEK®** products with perforations. While balsa lumber contains vessels which make the sheet porous, resin flow through the core thickness is slow & not controlled. With **BALTEK®** core, perforations equalize the pressure between the laminate on one side of the core vs. the other. This enables faster and more consistent resin flow throughout the part.

Selecting the proper finish option is the best way to control the resin flow across (and through) the part, as well as minimize part weight & cost.

Surface grooves create resin flow. The size and spacing of the grooves will dictate the flow rate, but also the amount of additional resin absorbed by the core sheet when infused. Very large grooves can also create stress concentrations if they prevent the fabric/fibers laying flat on the surface of the core. The standard groove for **BALTEK®** core enables good resin flow while minimizing resin absorption and potential surface print through.

For parts with complex geometry, a flexible configuration will be necessary. If the section is only curved in one direction, semi-CK or GPs can be used. 3d curves will need our ContourKore (CK) plus perforations or GPs-all form. Often a combination of different finish options within the same part is best.

Since the greatest amount of time and labor building parts with vacuum infusion is the dry installation, we recommend incorporating a pre-cut kit for all materials (fabric, core, consumables). Without a pre-cut kit, each piece must be fit, cut, adjusted, possibly trimmed, re-adjusted then installed.

Dry installation of core sheets into a part:
The surface should be checked for debris or contamination before **BALTEK®** core is placed into the part. The surface should also be smooth so there are no spaces/gaps between the laminate and core. Gaps can occur at ply drop-offs or overlaps, especially in corners. Care should be taken to stagger ply drops/overlaps to minimize/eliminate any space between fabric & core.

It is best to dry fit the core over the entire part before any tack spray is applied. This prevents re-work if the first pieces are placed in the wrong location or misaligned. Make sure the kit has all the proper fillets at all edges and changes to thickness.

Applying tack spray:
Unfortunately, most tack spray products are designed for fabrics, not core. It is best to try a few different brands to determine which provides the best hold with the least amount. Each tack spray supplier will have a maximum recommended coverage. Testing has demonstrated a reduction in laminate strength above these limits. This is even more important for high strength cores such as **BALTEK®** balsa. Often it takes time for the tack spray to become sticky (like contact adhesive). It is best to wait after applying the adhesive before positioning the section of core in place.

It is best to apply the tack spray outside the part or inside a cardboard box to minimize/eliminate overspray. Best results are obtained by spraying the fabric under the core & the core surface. Make sure the core is completely against the surface with no gaps underneath or wrinkles (CK/flexible sheets). The sheet should not move or pull away from the laminate once installed. If the piece/sheet must be adjusted, try not apply more adhesive.

Once the core is fit into the part, any noticeable gaps between sheets should be filled. If left open, they can lead to resin racetracking (uncontrolled flow). Very large gaps may also result in excessive resin consumption and possible concerns with too high exotherm. Filling gaps helps ensure the resin flow front is controlled & consistent. Gaps may be filled using slivers of core or strips of fabric, or texturized roving. Proper gap fill will also ensure fabric stays flat over the core for peak part performance.

Resin absorption into the core:
Like closed cell foam cores the amount of resin absorption of **BALTEK®** products is dominated by surface and sheet finish option (i.e. rigid vs. CK) There are two additional factors to consider with **BALTEK®** core, density & thickness. Balsa lumber contains a small amount of

vessels that run along the grain. These provided food & water when the tree was alive. The concentration of these vessels is dependent on the lumber density; higher density contains more vessels [add pictures]. This results in an inverse relationship between density and resin absorption; lower density **BALTEK®** products absorb less resin. Furthermore, since the vessels run through the thickness, the amount of resin absorption will also be greater as the core thickness increases. Sheet quality is also important. Gaps between lumber can be filled with slivers of core or fabric (same as a gap between sheets).

Priming resin?

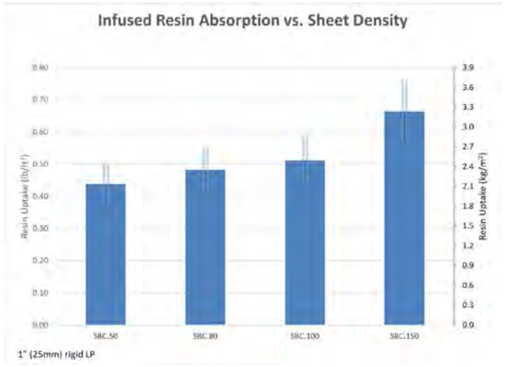
Finally, it is good practice to watch the part during resin fill and record your observations. Note areas of racetracking and different flow rates (port vs. starboard hull for example). These can indicate leaks or problems with vacuum levels. This will also assist with improvements and corrections of dry material installation such as core fit as well as feed and vacuum line layout/ spacing.

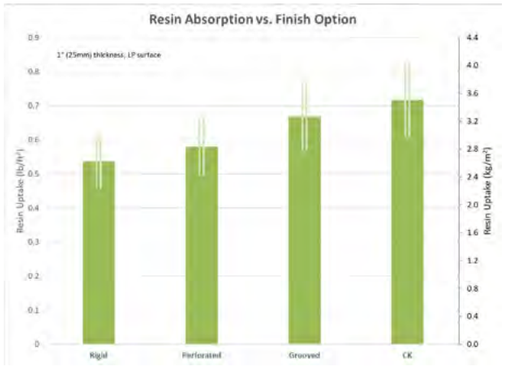
Once the part is placed under vacuum the core will dry out partially. It is generally not recommended to introduce resin into the part immediately to allow residual moisture in the fabric to evacuate. It is also recommended to not leave parts under full vacuum for hours as this can dry out the core too much. The recommended moisture content for closed mold processes like vacuum infusion is 6 - 8%. Some shrinkage of the sheet is associated with lower moisture content. This can become an issue if the moisture content of the core is elevated when it is cut into a kit or installed in the part. This can be partially mitigated by using **BALTEK®** AL600/10.

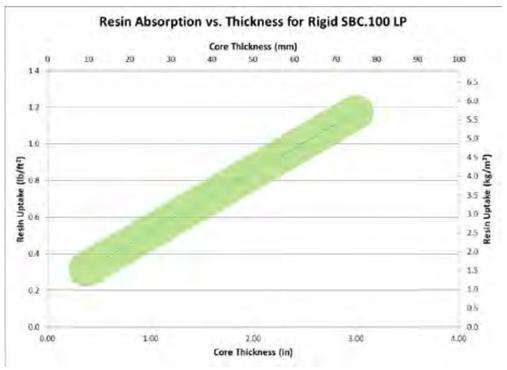
5.5 Platen Press

A release film, in place of a release agent can often be used in a platen press.

Follow lay-up procedure for vacuum bagging. Apply 15 - 20 psi platen pressure until cured.







5.6 Prepreg Face Skins

See the processing guide for bonding **BALTEK®** balsa core with Prepreg Reinforcements, Precured skins, or metallic faces. Use **BALTEK®** rigid panels (AL600/10 coating is not required). Adhesive selection is critical. The adhesive's compatibility with the face skin and core should be evaluated, as well as the ability to obtain a 'void free' bond line. MC should be around 7% to prevent steam burst caused by the high temperature process causing delamination.

5.7 Precured skins or sheet metal face skins

The use of rigid sheet end grain balsa is recommended. Adhesive selection is critical. The adhesive's compatibility with the face skin and core should be evaluated, as well as the ability to obtain a 'void free' bond line.

6 Processing **BALTEK®** Core with Prepreg Reinforcements

BALTEK® with LamPrep surface finish is recommended for use with elevated temperature cure film adhesives.

6.1 Film adhesive

Typically a 250 g/m² controlled flow thixotropic film adhesive can be used to successfully bond **BALTEK®** core. Confirm processing details with the film adhesive supplier. If contourable material is to be used, it is recommended that the scrim, which holds the sheet together, is removed during the core application process, so as not to interfere with the wet out and adhesion of the film adhesive.

The properties of film adhesives from different manufacturers can vary widely. When using these materials for the first time, it is essential to prove out the suitability of these materials prior to proceeding.

6.2 Second Skin

Film adhesive of 400 g/m² is often used on top of the **BALTEK®** core prior to applying the second prepreg laminate. The moisture content of the core should be held between 3 - 6% during the lay-up and cure of the second skin. This is to avoid the potential of moisture or steam affecting the second skin during the elevated temperature cure cyde. The moisture content can be checked with a suitable pin-type moisture meter and the end-grain balsa vacuum or oven dried as required.

Contact us for further information about processing **BALTEK®** cores with prepregs.

7 Bonding Balsa Core with Epoxy Resin System

Vacuum bag compaction is recommended when bonding **BALTEK®** core to a laminate surface using epoxy resins, as vacuum bagging provides the most weight efficient bond line consolidation.

The long open times available with epoxies also allow large areas of core material to be bonded at one time.

When using **BALTEK®** CK (contourable end-grain balsa), it is generally recommended to install the core scrim side up whenever possible. LamPrep or AL600/10 end grain surface treatment can be used with epoxies. The AL600/10 will minimize resin absorption.

7.1 Laminate Surface and Core Preparation

Laminate surface preparation is important when bonding to a cured epoxy surface. If peel ply was not used, then the entire surface will require machine sanding with 80 grit paper to leave a mat finish without areas of gloss. If peel ply was used, then sand smooth raised edges and ridges that could hold the core material away from the surface. (If unsure, follow the resin supplier's recommendations and test bond to a sample section of the laminate prior to a full core installation). Precut and pre-fit the sheets before bonding in place, particularly when vacuum bagging. The sheets should fit together with minimal gaps.

7.2 Mixing and Applying the Adhesive

An epoxy adhesive can be blended from a suitable epoxy resin thickened to non-sag consistency using a thixotropic modifier such as Cabosil or Aerosil. Note: Due to the high strength of **BALTEK®** core, a low density modifier such as Micro Balloons, which might be used to bed a low density foam core, could result in a bond line that would fall under stress before shearing the balsa.

Use a notched trowel at approximately an 80 degree angle to the surface. Flat surfaces - apply the adhesive in a uniform thickness of approximately 0.04 inch (1 mm).

Curved surfaces with CK, scrim up - areas of high curvature will use more adhesive to fill open kerfs. The amount can be determined on site and troweled in place as required. Core materials over 1 inch thickness may require additional adhesive to be applied to open kerfs, after resin coating, while the sheet is back curved over a drum. Filling the kerfs improves the integrity of the core layer and prevents possible moisture collection if the skins are ever compromised. Male molding or scrim down core application does not require filling of open kerfs at this time.

7.3 Priming the Core

With larger applications, particularly when vacuum bagging, steps 2 and 3 can occur concurrently to fully utilize the available working time of the epoxy. Just prior to installation, pre-coat one side of the **BALTEK®** core sheet with laminating resin. The average amount of resin to wet out the surface is 1.5 oz (40 grams) per sqft for LamPrep surface treatment and 0.70 oz (20 grams) per sqft for AL600/10 coated. The resin is generally hand applied with a short nap or foam covered roller.

Female molding:
Additional resin is usually required to wet out the kerfs of contourable **BALTEK®** balsa sheets. Lay the sheets over a large drum and use a laminating brush to coat the open kerfs.

Tum the sheet 90 degrees to coat the open kerf's in the other direction. Coating the open kerfs will help the epoxy adhesive to flow in and fill the kerfs during the bonding process. (Cover the drum with a plastic cover to prevent paint transfer and allow easy clean up).

Male Molding:
If bonding the core with the scrim side down there is no need to wet out open kerfs at this time.

7.4 Core Installation

Contact molding will require the **BALTEK®** core sheets to be positioned and then bedded using metal compaction rollers. Use moderate pressure to bed the sheet evenly into the epoxy adhesive and fill any open kerfs. It is important that no voids remain between the laminate and the core.

Avoid excessive pressure or walking on the core before the adhesive has cured. Over-squeeze out of the adhesive can occur resulting in a localized dry bond. Fillet strips or low density epoxy filler can be used to close out the edges and fill any gaps. Fillet strips can be resin primed and bonded into place at the same time as the **BALTEK®** core.

Vacuum bagging: The open time of the epoxy adhesive, which varies with film thickness and workshop temperature will determine the amount of working time available when vacuum bagging.

The vacuum bag must be sealed and evacuated before the epoxy adhesive starts to gel. First pull 10 - 15 inches of mercury for initial compaction then after a few minutes reduce the vacuum reading to 5 inches of mercury until the resin has cured.

7.5 Inside Skin

The surface and edges of the **BALTEK®** core should be smooth with no ridges. Fill any voids in the core layer. Sharp comers should be rounded for laminate to run over without lifting or crimping and any steps tapered for a smooth transition.

Male molding: Open kerfs can be filled at this time with a low density epoxy paste and sanded smooth. Prime the surface of the **BALTEK®** core with a coat of laminating resin just prior to applying the laminate.

8 Bedding and Bonding **BALTEK®** cores with Chopped Strand Mat

Chopped Strand Mat (CSM) has been used for many years with polyester and vinylester resin systems to bed and bond **BALTEK®** core material in place. Contact Molding and Vacuum Bag consolidation methods can be used. Vacuum Bagging provides a consolidation not possible with contact molding, which can enhance the overall quality of the core to skin bond. All open kerfs in the core layer are best filled during the core installation. On tightly curved surfaces the resin / CSM combination does not fill open kerfs of contoured cores as well as core bonding adhesives. Filling the kerfs improve the integrity of the core layer and prevents possible moisture intrusion if the skins are ever compromised.

8.1 Laminate surface preparation

The cured laminate surface that the core is to be bonded to should be smooth. Remove any raised edges or ridges that could hold the core material off the surface. Overall sanding with 80 grit paper may also be required for good adhesion this depends on the resin system and the amount of time after initial cure. Remove any sanding dust from the surface before proceeding. If unsure follow the resin supplier's recommendations and test bond to a sample section of the laminate prior to a full installation.

8.2 BALTEK® core preparation

Precut and pre-fit the sheets of core material before bonding in place, particularly when vacuum bagging. Individual core sheets should fit together with minimal gaps and any edges that do not butt to another surface should be beveled at a 3-1 slope to minimize fiber crimping and voids, which are inevitable when trying to laminate around sharp corners.

Contact Molding:
BALTEK® LamPrep should have the down side pre-wet with standard catalyzed resin immediately before appilcatlon into the CSM. **BALTEK®** AL600/10 coated balsa does not require prewetting when being bedded into CSM. Pre-wetting is recommended for all contourable forms of **BALTEK®** cores to ensure proper filling of the kerfs.

Vacuum Bagging:
BALTEK® LamPrep should have the down side (hot coated) at least 2 hours ahead of time with resin catalyzed to a 10 minute per 100 gram cup gel time. This hot coat minimizes resin absorption into the core while under vacuum. Approximate coverage is around 1.5 oz (40 grams) per sqft.

Lay the **BALTEK®** sheets flat and spray apply or hand apply the resin with a short nap length roller. Be careful not to over coat. even if the surface looks dry and avoid gluing the small blocks together on a contoured sheet **BALTEK®** AL600/10 coated core does not require Hot Coating when being bedded into CSM.

Scrim Side Up:
When using contourable **BALTEK®** balsa products, it is recommended to install the core scrim side up whenever possible. If the scrim side is placed down, it is best to pre-coat the scrim surface to displace air between the scrim weave, however In this case the pre-coating should be done within just 1 minute of installation to avoid the blocks of balsa from falling off the scrim (hot Coating ahead of time is not recommended).

8.3 Chopped Strand Mat Application

A layer of 1.5 oz/sqft (450 g/m^2) chopped strand mat is applied to the laminate surface and rolled out with compaction rollers to remove all air entrapment (this is an important step as any voids in this layer will result in poor bond line properties and could allow water transfer to the end grain of the core material.) Set the catalyst rate so that the bed coat resin gels in 20 - 40 minutes (note: The bed coat gel time may vary slightly from a cup gel time, especially when the catalyst rate is less than 0.75% of 60%-MEKP).

Introduction, Storage, Handling, Use & Processing Guidelines
BALTEK® SBC, VBC, IG, IGp, Structural Balsa Cores

The CSM layer should have a higher-than-normal resin content of 80/20 - resin/glass by weight to help ensure a saturated bond line.

8.4 Core Installation

Contact Molding:
Use metal compaction rollers with moderate pressure to bed the core material evenly into the layer of CSM. It is important no voids remain between the laminate and the core.

Avoid excessive pressure or walking on the core before the CSM has cured. Over-squeeze out of resin can occur resulting in a localized dry bond or void. Fillet Strips used for edge detailing can be resin primed and bonded into place with CSM at the same time as the **BALTEK®** core.

Vacuum Bagging:
The vacuum bag must be sealed and evacuated before the CSM / resin layer starts to gel.

Start with 10 inches of mercury for initial core compaction (measured from the bag), then after a few minutes reduce the vacuum to 5 inches of mercury until the resin has cured.

8.5 QC check

Allow the cure to develop then check the bond. Tapping the core can reveal voids in the bond layer. Repair voids as necessary.

8.6 Preparation for the inside skin

The surface and edges of the **BALTEK®** core should be smooth without ridges. Fill any voids in the core layer. Core bonding adhesive can be used. Any remaining sharp comers should be rounded or tapered to allow the (second) laminate to run over smoothly.

Pre-coating the top surface is recommended on contoured **BALTEK®** sheets just before laminating to reduce air entrapment within scrim and other surface Irregularities. This helps produce a void free bond line.

A 3/4oz (minimum) Chopped Strand Mat is recommended next to the core as the first layer of the inside skin. This will help fill small variations in the core surface and add significant peel strength to the laminate core bond line.